

Dassault Systèmes – Meeting Industrial Equipment Business Challenges

CIMdata Commentary

The industrial equipment (IE) market is large and varied, ranging from fabricated metal components and sub-assemblies to manufacturing equipment that convey, assemble, or produce products, and mobile machinery like farming or construction equipment. IE companies have different business models, development and production requirements e.g., build to order (BTO). In order to be successful, IE companies must respond to changes in market needs, new technologies, ever-increasing product complexity, expanding end customer and regulatory requirements, and relentless cost pressures. Products may have lifecycles measured in years or decades, which require ongoing service, and may be significantly modified or upgraded over time. To successfully meet changing global market requirements, IE companies need PLM solutions and technologies that enable them to produce innovative, customized products faster, achieving both accuracy and profitability.

IE Company Business Challenges

Customers of IE purchase that equipment based on performance specifications tied to return on investment (ROI) rather than on features and functions. Advanced IE is key to producing products that an end customer can operate profitably. Further, IE customers are requiring more and more customization or configuration of their equipment. The successful IE supplier must not only understand how to produce and support their products, it must also have a deep understanding of their customer's business.

The products created using IE could be discrete like a computer chip, a formulation like paint or gasoline, or harvested grain on a farm. In the case of construction equipment like an excavator, the volume of material moved per hour controls the revenue. Faster and bigger equipment generally increase production units, but costs more to purchase and to operate. Since very few companies replace all their IE at the same time, a new piece of IE has to integrate efficiently into existing operations. With long productive lives, IE must be designed for easy maintenance and upgrades of performance and functionality. IE suppliers need to satisfy all these needs in order for their customers to optimize their IE ROIs.

Dealing with market globalization demands a sound strategy and appropriate product development processes and technologies. Customers in different regions have different requirements, so IE products need to be adapted to local markets. As markets grow, it often makes business sense to include localized product capabilities to support specific market requirements. Supporting distributed development and production is complex and requires advanced technologies and processes to effectively distribute and manage product definitions, as well as production and support both internally and across the supply value chain.

To support customer requirements, IE suppliers need to manage increasing product, production and support complexity. IE has complex Bills of Materials (BOMs) with hundreds, and in some cases tens of thousands, of components. Key components may be designed and manufactured in-house, but many components and sub-assemblies are purchased. As each customer wants a unique configuration, managing multiple BOMs is an enormous task

and requires sophisticated functionality. And since providing service after the sale can generate significant revenue, IE suppliers are increasing services to their customers to provide spare parts for maintenance and add-ons or upgrades to improve equipment performance and machine flexibility over the life of the product. Thus they can generate significant revenues and are becoming services focused companies.

IE companies generally focus on a handful of core competencies and develop intellectual property around very specific areas. While IE production is typically low volume, it is not usually one off, and has some economies of scale. Industrial equipment production strategies include:

- BTO—a product is scheduled and built-in response to a confirmed customer order
- CTO—products are assembled from pre-designed components and options
- ETO—the product is designed and built to meet unique customer specifications
- BTS—configurations and production plans are based on sales forecasts and historical demand
- Mass Production—production of large quantities of standardized products

A best practice for supporting industrial equipment businesses is to structure flexible product lines and design products with modular architectures so that product lines are segmented based on application requirements. The importance of modular IE architectures increases as complexity increases. Machine modules are designed to cover a range of requirements and to have features and options that allow the product to be tailored to fit specific customer needs. In many cases, each product will have a unique configuration (a market of one) due to the features and options required to meet customer-specific requirements. The key to controlling a modular design is to use a systems engineering methodology to enable maximum reuse of modules and technology by controlling interface definitions. Systems engineering enables companies to ensure that customer requirements are traceable through product design, build, and delivery. Additionally, strong configuration management must be enforced to ensure that all documentation is clear, concise, and valid.

Modern IE is a complex mix of mechanical, hydraulic, electrical, electronic, and software systems, usually identified as mechatronic systems. Historically, these systems have been designed independently, and only integrated and tested at final assembly. Problems found in this late integration phase can cause significant delays in customer deliveries. Project managers need to be able to define, track, visualize, and validate all the systems in the context of the complete product to ensure on time delivery at the target cost.

While engineers have been using calculations to improve designs for centuries, the evolution of computer hardware and software development has dramatically changed how the modern engineer works. CAE software now routinely performs calculations that were previously impossible or cost prohibitive. Hand calculations can be used for very early conceptual work or quick sanity checks, but today's engineers use software to simulate variations and optimize designs while minimizing expensive and time-consuming physical testing. Modern software can simulate most, if not all, physical phenomena used in IE from components and subsystems through automation systems and complete production line simulations.

Supply chains are the lifelines of an IE manufacturer. While many of the components are off the shelf commodities (e.g., screws, bolts, bearings, and wire), many critical components are unique, and require custom manufacture. The sophistication of critical components, compressed delivery schedules, and cost drives many industrial equipment manufacturers

into tighter supply chain relationships. PLM innovations are providing ways to transform a supplier into a preferred partner so both companies can reap the rewards of a better product and a more satisfied end customer.

IE companies are seeing significant opportunity to generate revenue through their service and support organizations. All machinery needs maintenance including upgrades and enhancements. By supporting the as-maintained configuration for each product, IE suppliers can anticipate and coordinate required and optional services with their end customers.

Dassault Systèmes IE Solutions

In July of 2008, CIMdata released its initial review of ENOVIA Version 6, (Dassault Systèmes' V6 Program: "A Focus on PLM 2.0 for Enterprises")¹. One of the strengths of the Version 6 solution suite is that it can be considered a "Configured To Order" system for IE companies. The Version 6 Portfolio is structured into three categories: applications, online platform, and universal services. It is designed to support all related product information about IE products from concept through end of life. A variety of tools are used to create, manage and distribute all that information. V6 includes a wide variety of applications that can be configured into a system to support the lifecycle of products in many industries.

The core of Dassault Systèmes' IE solution suite, ENOVIA, is the product lifecycle platform. It is used to capture and manage all the information, files, data, metadata, relationships and processes that define an IE product throughout its lifecycle. It provides the tools and a collaborative environment to define complex systems utilizing the RFLP (requirement, functional, logical, physical) process. ENOVIA is designed to scale from a single workgroup through a distributed global supply chain. It helps ensure that the right people get access to the right information at the right time both within the enterprise and throughout the supply chain. ENOVIA also supports a variety of BOM views including the engineering BOM, manufacturing BOM, as-built BOM, and as-maintained BOM.

ENOVIA has several functional modules that support IE design. Requirements Central allows the creation and tracking of items that represent the voice of the customer, and ensure that the product meets those requirements. Program Central enables activities to be assigned and tracked in real-time and allows deliverables to be directly linked to activities. Systems engineering is supported by Variant Configuration Central, which enables users to define and manage a product's architecture and interfaces to support features and options. Sustainability is supported by Materials Compliance Central, an application to track, analyze, and report on controlled and hazardous substances as defined in regulations.

Dassault Systèmes' Domain Applications include CATIA, SIMULIA, DELMIA and SOLIDWORKS:

- CATIA is an authoring tool for geometry creation. It includes knowledge-based tools to automate design processes and support systems engineering.
- SIMULIA is a comprehensive CAE solution suite that enables users to simulate complex problems and products. Its multi-physics capabilities support preliminary design analysis and detailed expert-level analysis.

¹ For more information on Dassault Systèmes and their solutions, see www.3ds.com.

- DELMIA supports NC tool path simulation, manufacturing process planning and simulation, lean manufacturing, production line control programs and complete digital commissioning of factories.
- SOLIDWORKS includes 3D design, simulation, data management, communication, and environmental impact analysis tools.

Dassault Systèmes' Universal Services include 3DVIA and EXALEAD:

- 3DVIA supports creation of 2D and 3D content. It can be used to create virtual reality simulations of equipment operations and content for sales and service documents.
- EXALEAD provides advanced, extended search capabilities to locate and use a wide range of product related information that may be maintained in distributed systems.

An excellent example of the application of Version 6 in the Industrial Equipment space is Meyn Food Processing Technology B.V., a poultry processing equipment manufacturer. Meyn has operations spread across many countries around the world and has design and manufacturing facilities in The Netherlands, Poland and the U.S. The processing equipment consists of large assemblies that include mechanical, electrical and software components. Version 6's modular product architecture enables Meyn to tailor products to meet complex customer configuration requirements. ENOVIA Version 6 also enables Meyn to streamline collaboration with external partners and suppliers. The collaboration platform allows employees and partners to collaborate visually in order to boost innovation. Meyn is also taking advantage of its system engineering capabilities that link product requirements to the product data stored within the Version 6 environment. This enables continuous validation and ensures that the product will meet customer requirements when the equipment is delivered.

Summary

Technological advances over the past few decades have made doing business much more complex. There are new opportunities for industrial equipment companies to grow, but with increased risks and fierce competition. To compete effectively, companies need to beat the competition and exceed customer requirements. IE companies need to be able to optimize their business and product development processes by leveraging best in class tools and technology.

CIMdata believes that the PLM solutions and technology from Dassault Systèmes have the depth and breadth to help IE companies develop and support products that meet and exceed their customers' requirements. Dassault Systèmes' solutions provide IE companies with solutions that can enable them to develop validate, deliver and support new and innovative products that will make their customers more profitable and successful. Companies that have a need for managing their IE development and support products and processes should consider Dassault Systèmes IE solutions.

About CIMdata

CIMdata, an independent worldwide firm, provides strategic management consulting to maximize an enterprise's ability to design and deliver innovative products and services through the application of Product Lifecycle Management (PLM). CIMdata provides world-class knowledge, expertise, and best-practice methods on PLM. CIMdata also offers research, subscription services, publications, and education through international conferences. Visit <http://www.CIMdata.com> for more information.